COMPUTATIONAL FLUID DYNAMICS (ELECTIVE-III)

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS (15)

Basics of computational fluid dynamics – Governing equations of fluid dynamics – Continuity, Momentum and Energy equations – Chemical species transport – Physical boundary conditions. Mathematical behaviour of PDEs on CFD – Elliptic, Parabolic and Hyperbolic equations-well posed

problems.

UNIT II BASIC ASPECTS OF DISCRETIZATION (13

Introduction- Intrduction to Finite Differences- Difference equations-Explicit and Implicit approaches: Definition and contrasts-Errors and analysis of stability-Grids with the appropriate transformation –metrics and jacobians-Form of the governing equations suited for CFD revisited-stretched grids-Boundary fitted coordinate system-adaptive grids-some modern developments in grid generation.

UNIT III SOME SIMPLE CFD TECHNIQUES (17)

Introduction-The Lax-Wendroff Technique-MacCormack‟s Technique-Viscous flows-Conservation-pace marching-The Relaxation Technique and its use with low speed inviscid flow-Aspects of numerical dissipation and dispersion-The Alternating Direction Implicit (ADI) Technique, The Pressure correction technique-application to incompressible Viscous flow.

TEXT BOOKS:

1. Anderson J.D., “Computational Fluid Dynamics: The Basics with Applications”, McGraw-Hill Publishing Company Ltd.
2. Versteeg, H.K., and Malalasekera, W., “An Introduction to Computational Fluid Dynamics: The finite volume Method”, Pearson Education Ltd.Second Edition, 2007.
3. Ghoshdastidar, P.S., “Computer Simulation of flow and heat transfer”, Tata McGraw Hill Publishing Company Ltd., 1998.

REFERENCES:

1. Patankar, S.V. “Numerical Heat Transfer and Fluid Flow”, Hemisphere Publishing Corporation, 2004. AULibrary.com99
2. Chung, T.J. “Computational Fluid Dynamics”, Cambridge University, Press, 2002.
3. Ghoshdastidar P.S., “Heat Transfer”, Oxford University Press, 2005
4. Muralidhar, K., and Sundararajan, T., “Computational Fluid Flow and Heat Transfer”, Narosa Publishing House, New Delhi, 1995.
5. ProdipNiyogi, Chakrabarty, S.K., Laha, M.K. “Introduction to Computational Fluid Dynamics”,Pearson Education, 2005.
6. Anil W. Date “Introduction to Computational Fluid Dynamics” Cambridge University Press, 2005.